NATURAL RESOURCES CONSERVATION SERVICE

VIRGINIA CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

(Feet)

Code 380

DEFINITION

Linear plantings of single or multiple rows of trees or shrubs or sets of linear plantings.

PURPOSES

- To reduce soil erosion from wind.
- To protect plants from wind related damage.
- To provide shelter for structures, livestock, and recreational areas.
- To enhance wildlife habitat by providing travel corridors.
- To reduce impacts from heavy snows.
- To provide living noise screens.
- To provide living visual screens.
- To improve irrigation efficiency.
- To enhance aesthetics.
- To increase carbon storage.

CONDITIONS WHERE PRACTICE APPLIES

On any areas where linear strips of woody plants are desired and suited for the protection of soils, crops, livestock, and farm structures and where wildlife habitat is needed.

CRITERIA

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

The location, layout, and density of the planting will accomplish the purpose and function intended within a 20-year period.

At least 3 different tree or shrub species are to be used in designing a multiple-row windbreak or shelterbelt for any purpose.

Where a mixture of species are used in multiple-row windbreaks, plant a high crown density species on the outside row on the windward side.

The maximum design height (H) for the windbreak or shelterbelt shall be the expected height of the tallest row of trees or shrubs at age 20 for the given site.

Species must be suitable and adapted to the soils, climate, and site conditions.

Site preparation shall be sufficient for establishment and growth of selected species, not contribute to erosion, and be appropriate for the site. Refer to the publication Windbreak Establishment and to the NRCS Virginia Practice Standard *Forest Site Preparation* (*Code 490)*.

Only viable, high quality, and adapted planting stock or seed will be used. Contact the Virginia Department of Forestry for information about planting stock and availability.

The planting shall be done at a time and manner to ensure survival and growth of selected species. Refer to NRCS Virginia Practice Standard *Tree and Shrub*

Establishment (Code 612) for more information about planting.

The planting will be protected from adverse impacts such as livestock damage or fire.

Plantings will not interfere with existing structures or utilities (above or below ground).

Avoid locations that will create hazards to safety and health such as road ditches, junctions, and utility rights-of-way.

Plantings are to be located across prevailing wind direction and on hilly terrain, along the contour when possible.

If wood production is a secondary objective, plant at least five rows to permit equipment for thinning and harvesting.

Roadways through windbreaks should be at an angle or curved to reduce wind tunneling.

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species.

Follow the guidelines in the NRCS Virginia Practice Standard *Pest Management (Code 595)* for pesticide recommendations.

Comply with applicable federal, state, and local laws and regulations during the installation, operation, and maintenance of this practice.

ADDITIONAL CRITERIA TO REDUCE WIND EROSION; PROTECT GROWING PLANTS

The windbreak will be oriented as close to perpendicular to the troublesome wind as possible.

The interval between windbreaks shall be determined using current, approved, wind erosion technology. Interval widths shall not exceed that permitted by the soil loss tolerance (T), or other planned soil loss objectives. Calculations shall account for the effects of other practices in the conservation management system.

For wind erosion control, temporary measures will be installed to supplement the windbreak until it is fully functional.

Sites, fields, and plants are protected within an area 10 times the design height (H) on the leeward side and two times the design height (H) on the windward side of the windbreak.

CRITERIA FOR SPACING

Spacing between plants shall be based on the needed growing space for plant type and species, the accommodation of maintenance equipment, and the desired characteristics of the stem(s), branches, and canopy as required for a specific species.

Two or three rows of trees and shrubs, 6 feet apart are most effective.

If using only shrubs in the windbreak, space shrubs 2 to 5 feet apart in each row.

Pines should be no more than 8 feet apart in rows, red cedar, 5 – 6 feet apart.

Stagger each tree in rows between the trees or shrubs of adjacent row.

When using only shrubs, plant a strip no less than 4 feet wide on the windward side of the field to be protected.

Recommended Tree and Shrub Species for Windbreaks[1]

Trees and Shrubs	Average Effective Height (ft)	Spacing (ft) Within Rows	Between Rows
Shortleaf Pine Pinus echinata	40 – 55	6-8[2]	6-10
Virginia Pine Pinus virginiana	40 – 55	6-8	6-10
Loblolly Pine Pinus taeda	40 – 55	6-8	6-10
Longleaf Pine[3] Pinus palustris	25 – 35	6-8	6-10
White Pine[4] Pinus strobus	40 – 55	6-8	6-10
Eastern Red Cedar Juniperus virginiana	20 – 30	6-8	6-10
American Holly Ilex opaca	20 – 30	4-6	6-8
Yaupon Holly Ilex vomitoria	20 – 30	4-6	6-8
Chinquapin Castenea pumila	15 – 25	6-8	6-10
Chickasaw Plum Prunus anagustifolia	15	6-8	6-10
Washington Hawthorne Crategus phaenopyrum	15 - 25	6-8	6-10
Bayberry or Southern wax myrtle Myrica sp.	15 – 20	6-8	6-10
Bronze elaeagnus Elaeagnus pungens	4 – 10	4-6	6-8
Red Chokeberry Photinia pyrifolia	4 – 10	4-6	6-8
Black Chokeberry Photinia melanocarpa	4 - 10	4-6	6-8
Blackhaw viburnum Viburnum prunifolium	4 - 10	4-6	6-8
VA-70 Lespedeza[5] Lespedeza thunbergii	5 - 7	2-4	4-6

1. Many other species of trees and shrubs are possible. Contact the Virginia Department of Forestry or the Natural Resources Conservation Service for more information.
2. For maximum effectiveness, pines should be no more than 8 feet apart within or between rows.
3. Use only in southeastern counties where longleaf is native.
4. Use only in western counties where white pine is native.
5. For maximum effectiveness, plant VA-70 lespedeza 2 feet between rows and 18 inches apart within the row.

Acceptable options for single row windbreaks include:

Eastern redcedar – 6 ft. spacing
Loblolly pine – 8 ft. spacing and interplanted with a shrub
Oaks – 10 ft. spacing and interplanted with a shrub

ADDITIONAL CRITERIA TO MANAGE SNOW DEPOSITION

The windbreak will be oriented as close to perpendicular to the snow-bearing wind as possible.

For snow distribution across a field, the windbreak density (during expected snow-producing months) shall not be less than 25 percent nor greater than 50 percent. The interval between barriers will not exceed 20H.

For snow accumulation, the minimum barrier density, during expected snow-producing months, will be 50 percent.

Windbreaks will be located so that snow deposition will not pose a health or safety problem or obstruct human, livestock, or vehicular traffic.

Where water erosion and/or runoff from melting snow is a hazard, it shall be controlled by supporting practices.

Refer to the publication “Windbreaks for Snow Management” for more information.

ADDITIONAL CRITERIA TO PROVIDE SHELTER FOR STRUCTURES, LIVESTOCK, AND RECREATIONAL AREAS

The planting will be oriented as close to perpendicular to the troublesome wind as possible.

For wind protection, the minimum barrier density will be 65 percent during the months of most troublesome wind and the area to be protected will fall within a leeward distance of 10H.

Drainage of snowmelt from the windbreak shall not flow across the livestock area.

Drainage of livestock waste from the livestock area shall not flow into the windbreak.

Refer to the publication “Windbreaks for Livestock Operations” for more information.

ADDITIONAL CRITERIA FOR NOISE SCREENS

Noise screens shall be at least 65 percent dense during all times of the year, as tall as, and as close to the noise source as practicable.

The length of the noise screen shall be twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier shall not be less than 65 feet wide. For moderate speed traffic noise, the barrier width shall not be less than 20 feet wide.

Species selected will be tolerant to noxious emissions, sand, and gravel depositions or salt spray from traffic areas.

ADDITIONAL CRITERIA FOR VISUAL SCREENS

Visual screens shall be located as close to the observer as possible with a density, height, and width to sufficiently block the view.

ADDITIONAL CRITERIA FOR PROVIDING OR ENHANCING WILDLIFE HABITAT OR TRAVEL CORRIDORS.

Plant species selection shall benefit targeted wildlife species.

Design dimensions of the planting shall be adequate for targeted wildlife species.

ADDITIONAL CRITERIA FOR IMPROVING AESTHETICS

To enhance aesthetics, use evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits.

ADDITIONAL CRITERIA FOR IMPROVING IRRIGATION EFFICIENCY

For sprinkler irrigation systems, the windbreak shall be as tall as the sprinkler heads.

The barrier shall not interfere with the operation of the irrigation system.

ADDITIONAL CRITERIA FOR CARBON STORAGE

For optimal carbon storage, select plants that are adapted to the site to assure strong health and vigor and plant the full stocking rate for the site.

CONSIDERATIONS

The needs of farming equipment will be considered when designing a windbreak system.

Selection of plants for use in windbreaks should favor species or varieties tolerant to herbicides used in the area.

Plants that may be alternate hosts to undesirable pests should be avoided.

All plantings should complement natural features.

Tree or shrub rows should be oriented on or near the contour where water erosion is a concern. Where water erosion and/or runoff from melting snow is a hazard, it should be controlled by supporting practices.

Wildlife should be considered when selecting tree or shrub species. Species diversity, including use of native species, should be considered to avoid loss of function due to species-specific pests.

Consideration should be given to adverse offsite effects.

Plants established in cropping systems should have root systems that do not affect crop growth and/or spread from root sprouts.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

The following actions shall be carried out to ensure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

Replacement of dead trees or shrubs will be continued until the barrier is functional.

Supplemental water will be provided as needed.

Thin or prune the barrier to maintain its function.

Inspect trees and shrubs periodically and protect from adverse impacts including insects, diseases, fire, wildlife damage, livestock, or competing vegetation.

Periodic applications of nutrients or irrigation may be needed to maintain plant vigor.

Refer to the publication “Windbreak Management” for guidance on maintaining a healthy and functional windbreak.

REFERENCES

1. Beohner, Patricia, James R. Brandle and Sherman Finch. “Windbreak Establishment”. University of Nebraska Extension EC 91-1764-B. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 6 pages. http://www.unl.edu/nac/pubs/ec/ec1764/

2. Brandle, James R. and Sherman Finch. “How Windbreaks Work”. University of Nebraska Extension EC 91-1763-B. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 4 pages. http://www.unl.edu/nac/pubs/ec/ec1763/

3. Strange, Craig and James R. Brandle. “Windbreak Management”. University of Nebraska Extension EC 96-1768-X. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 6 pages. http://www.unl.edu/nac/pubs/ec/ec1768/

4. Brandle, James R. and H. Doak Nickerson. “Windbreaks for Snow Management”. University of Nebraska Extension EC 96-1770-X. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 4 pages. http://www.unl.edu/nac/pubs/ec/ec1770/

5. Wight, Bruce, Theresa K. Boes and James R. Brandle. “Windbreaks for Rural Living”.

University of Nebraska Extension EC 91-1767-X. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 6 pages.
http://www.unl.edu/nac/pubs/ec/ec1767/

6. Quam, Vernon, LaDon Johnson, Bruce Wight and James R. Brandle. "Windbreaks for Livestock Operations". University of Nebraska Extension EC 94-1766-X. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 6 pages.
http://www.unl.edu/nac/pubs/ec/ec1766/

7. Quam, Vernon C., John Gardner; James R. Brandle and Teresa K. Boes. "Windbreaks in Sustainable Agricultural Systems". University of Nebraska Extension EC 91-1772-X. University of Nebraska, USDA Natural Resources Conservation Service, North Dakota State University and Forest Stewardship Program of the Nebraska Forest Service. 6 pages.
http://www.unl.edu/nac/pubs/ec/ec1772/

8. *Windbreak/Shelterbelt Conservation Practice Job Sheet*. USDA-NRCS. 1997. 4 pages.

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Approved Practice Narratives

(Feet)

CODE 380

380 D1 Windbreak/Shelterbelt Establishment: Multiple rows of trees or shrubs will be planted perpendicular to the prevailing wind direction. The number of rows, height, length, direction, and spacing of the windbreak or shelterbelt, and the species selected will be provided by the Virginia Department of Forestry or on a job sheet prepared by NRCS.